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National Highway Traffic Safety Administration

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# TRANSPORTATION SCIENCES CENTER ACCIDENT RESEARCH GROUP

Division of Calspan Corporation Buffalo, New York 14225

CALSPAN ON-SITE SCHOOL BUS/PEDESTRIAN ACCIDENT INVESTIGATION
CALSPAN CASE NO. 95-14/3
SCHOOL BUS: 1992 INTERNATIONAL CHASSIS/AM TRAN (WARD) BODY
LOCATION:

DATE:

1995

Contract No. DTNH22-94-D-07058

Prepared for:

U.S. Department of Transportation National Highway Traffic safety Administration Washington, D.C. 20590

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The crash investigation process is an inexact science which requires that physical evidence such as skid marks, vehicular damage measurements, and occupant contact points are coupled with the investigator's expert knowledge and experience of vehicle dynamics and occupant kinematics in order to determine the pre-crash, crash, and post-crash movements of involved vehicles and occupants.

Because each crash is a unique sequence of events, generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) or their safety systems.

# TECHNICAL REPORT STANDARD TITLE PAGE

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The driver of the bus was unaware of the event and continued for a distance of approximately two blocks before stopping the bus. As he opened the bifold door, the drawstring separated from the door and fell to the pavement; the drawstring remained intact with the jacket.										
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DATE:

1995

### **TECHNICAL SUMMARY**

This on-site investigation focused on a school bus/pedestrian accident that occurred within the city limits of on 1995, at 1500 hours. A 14 year old male pedestrian had exited the bus and as he cleared the door area of the vehicle, the driver closed the manually operated bifold door and accelerated from the bus stop. The large adjustable tab on the end of the right drawstring of the pedestrian's jacket became caught between the door and the right Bpillar area of the bus. The pedestrian began to run along the side of the bus and yelled to attract the attention of the driver. The driver heard the pedestrian, however, he continued to accelerate the vehicle unaware that the pedestrian was attached to the bus. The pedestrian subsequently fell or was pulled to the road surface by the drawstring approximately 190' past the designated bus stop. As he fell to the pavement, his jacket separated from his body and he was subsequently run over by the right rear tires of the bus, sustaining fatal abdominal and thoracic injuries. The school bus driver observed the pedestrian lying in the road in the convex mirror and proceeded the distance of a city block. A boy ran up to the bus and informed the driver that the pedestrian was lying in the road bleeding. He backed the vehicle toward the accident site and waited for emergency personnel to arrive on-scene.

The accident occurred on a local city street in a residential area. The road was 29' in width and was bordered by barrier curbs, grass, and concrete sidewalks. Parallel parking was permitted adjacent to both curblines, therefore the street was reduced to a single lane for both the east and westbound travel directions. The asphalt road surface was wet due to a light rainfall on the afternoon of the accident. The local street was straight with a positive grade estimated at three percent to the west with a posted speed limit was 25 mph.

The involved school bus was a 1992 International conventional chassis with an 65 passenger body. The bus was owned and operated by a contractor for the School District. The school bus was identified by vehicle identification number (V.I.N.) 1HVBAZRM with a bus body number of and a body model number of SS-29. The vehicle had a gross vehicle weight rating of 25,500 lbs., an odometer reading of 37,617 miles, and an hour meter reading of 3264.9 hours. The bus was powered by a 7.3 liter diesel engine that was coupled to a 4-speed automatic transmission. The transmission selector lever was mounted on the center mid instrument panel.

The exterior of the bus was equipped with a series of plane (flat) and convex mirrors to provide the driver with views across the frontal area and along both sides of the vehicle. Mounted on tripod bases to the front corners of the engine cowl were 8" diameter convex mirrors. There were two mirrors mounted on each side of the bus. The forward mounted mirrors were adjusted to provide the driver with a view of the area in front of the bus while the rear mounted mirrors provided the driver with a view down the sides of the vehicle. All of the convex mirrors appeared to properly adjusted and provided an excellent range of sight to the driver. The right rear mounted convex mirror provided the driver with an excellent view of the right door area. A person standing adjacent to he door area was fully visible in the left center area of the mirror. Large plane mirrors were mounted to the upper A-pillars of the bus. These mirrors were 6.375" in width and 15.125" in length and were positioned 67.25" above the ground. The right plane mirror provided the driver with a view along the right side of the bus. Persons of adult size positioned outboard of the right door were visible in the lower half of the right plane from the head to the waist area (refer to Photograph Nos. 73 and 74).

The interior of the bus was configured with eleven rows of high-back seats. The first ten rows consisted of three passenger seats while the eleventh row consisted of a three passenger seat on the right side and a two passenger seat on the left side to allow egress through the rear hinged emergency door. There were no lap belts for the passenger seated positions and no marked emergency side or roof exits. The right side entrance/exit door was a manually operated two panel door that was hinged at the center point and opened in a forward direction toward the inside of the stairwell. The door panels were 76.5" in length and contained four windows with the upper glazing panels measuring 18.5" in length and the lower panels 29.6" in length. The front door panel had a maximum width 16" with the glazing panels measuring 10.3". The trailing door panel was 12.6" wide with 8.6" wide glazing panels.

A rubber type weatherstripping/gasket was affixed to the trailing edge of the door panel which engaged with a V-channel along the right B-pillar when the door was in its fully closed position. The overall width of the rubber gasket was 2 9/16" with approximately 1.6" of the gasket overlapping onto the door panel. This was attached to the door panel with six sheetmetal screws on the interior surface and additional six screws on the exterior surface of the door. The protruding section of the gasket from the door panel was formed in a C-configuration which compressed against the V-channel. The interior curl of the C was approximately 9/16" wide with a gap of .375" between the compressible C-configuration and the section that was affixed to the door panel. The V-channel on the B-pillar was 1.75" in width (overall) with .125" wide rolled edges which yielded a internal width of 1.5". The interior walls of the V-channel tapered to a 0.25" wide flat center area that was 17/32" deep from the outside face of the channel. The V-channel and door gasket were single piece construction and extended the full height of the pillar and door panel.

On the interior of the door area was a stairwell that consisted of four stair treads and three risers. The first step was 12" above the ground with the following steps from bottom to top having risers of 8.4", 8.6", and 7.25" which terminated at the floor level of the bus. Located at the rearward side of the stairwell was a single rail handrail. The handrail was formed out of 1" diameter stainless steel tubing and was attached to the padded crash barrier that was located in front of the first seat on the

right side of the bus. The handrail extended out from the crash barrier at an angle of approximately 60 degrees and continued for 6.25" to a radius where it continued for a length of 34" perpendicular to the side surface of the bus. The lower end of the rail was fastened to the side wall of the bus at the V-channel/B-pillar juncture with a single cap screw.

On 1993, issued a recall bulletin for modification of the handrails on the Ward Volunteer school bus bodies. The modification involved the installation of a rubber pad between the base of the handrail and the side wall. In addition, the recall notice required repositioning of the modesty (kick) panel at the base of the crash barrier. The specification on the recall notice required a clearance of 1.5"between the handrail and the modesty panel. A copy of this recall notice is included as Attachment C of this report.

The accident involved school bus had been modified by the contractor prior to this incident. A 2" horizontal x 2.5" vertical soft foam rubber pad was placed between the base of the handrail and the side surface of the bus. In the area of the handrail flange, the foam was completely compressed. The upper edges of the foam pad protruded beyond the handrail flange which was designed to deflect objects (drawstrings, etc.) away from the handrail/sidewall juncture. The installation of the rubber pad is documented in Photograph Nos. 35-37.

The base of the modesty (kick) panel had also been repositioned by the bus contractor prior to this accident. This was evidenced by the holes in the floor and sidewall from the initial installation of the panel. It should be noted that only the base of the modesty panel had been repositioned as identified in the recall notice and not the entire crash barrier unit. The right outboard edge of the modesty panel (vertical edge) had been repositioned 1.25" rearward of the original attachment point. The original sheetmetal screw hole (#6 or 8 screw) was located 3.25" rearward of the V-channel and 2.375" above the floor level of the bus. This original screw hole was not plugged or protected and contained several heavy burrs around the perimeter of the hole. The bottom edge of the panel was affixed to the floor of the bus with four sheetmetal screws. The outboard screw had been repositioned 1.125" rearward while the second and third screws were repositioned 13/16 and 0.375" rearward respectively. The inboard fourth screw was either repositioned a scant amount or remained in its original position as the bottom flange covered the original position. The modification to the modesty panel is documented in Photograph Nos. 39-43. The lateral offset (clearance) between the handrail and the modesty panel was approximately 1 3/16" at the mid point of the panel.

The floor of the school bus extended from the vertical wall at the stairwell to the modesty panel and formed a shelf under the handrail. This shelf was approximately 23.25" in length and tapered from a width of 3.25" at the right B-pillar area to a width of 2.125" at the top of the stairs. During the inspection of the bus, a metallic snap from a clothing item was found on this shelf in the debris against the V-channel/B-pillar area, directly under the lower handrail attachment point. The snap was not related to this accident (refer to Photograph No. 37).

During the inspection process of the school bus, a simulated drawstring was constructed from a length of 0.125" diameter chalkline and a 1.25" (length) alligator clip. This drawstring was dragged along the modified handrail and on the first attempt, it snagged between the bottom of the rail and the screw hole in the side surface of the bus. Following additional attempts, the snagging was achieved on several tests as depicted in Photograph Nos. 44 and 45. The drawstring from the pedestrian's jacket would not snag at this location following numerous attempts.

The driver of the school bus was employed by the bus contractor as a substitute, part time driver. He held a valid CDL driver's license, however, he did not hold a current bus driver certification. This driver was formerly employed by the bus contractor and held the required certification for the 93-94 school year, but not for this current school year.

The involved pedestrian was a 14 year old male with a reported height of 66" and a police estimated weight of 130-140 lbs. He was wearing a STARTER SPORT, size extra large, medium weight jacket with a hood that was detachable. The outer shell of the jacket was blue in color with a maroon inner lining. The outer shell of the jacket was 100 percent nylon with the lining and hood composition of 65 percent polyester and 35 percent cotton. At the base of the jacket was a drawstring that was approximately 45" in length. The drawstring extended from grommets that were located 4" inboard of the zipper. The drawstring was 3/16" in diameter and consisted of a multiple strand fabric that was braided in a tightly woven pattern. Located at each end of the drawstring was an adjustable plastic tab that measured 1 1/16" in length, 0.625" in width, and 7/16" in depth. The spring loaded plunger protruded 0.25" outboard of the body of the tab. The ends of the drawstring were looped and knotted to prevent the tabs from separating from the string. A similar drawstring was incorporated into the hood of the jacket. In addition to the jacket, the pedestrian was wearing white athletic shoes, denim jeans, and he was carrying a book bag in an unknown hand/arm.

The bus driver was completing the afternoon schedule and was transporting middle school aged students. There was approximately seven students on board the bus as the driver was proceeding in a westerly direction through a residential area. The roadway was limited to a single lane due to legally parked vehicles at both curblines of the local street. The driver stopped at the east leg of a four-leg intersection for a stop sign. This intersection was a designated school bus stop. He discharged a 12 year old male (police reported witness) and the involved 14 year old male pedestrian. The witness stated that the 14 year old exited the school bus last and stopped outboard of the door area of the bus to talk to a student on board the bus. He further stated that as the involved pedestrian turned to talk to the student, the driver closed the bifold door. The driver stated to police that as he observed the pedestrians clear the bus, he closed the door and accelerated the bus and proceeded through the intersection.

The right drawstring of the pedestrian's jacket became caught in the door of the bus. As the driver accelerated the bus, the pedestrian began to run along side of the bus and yelled to gain the attention of the driver. The witness stated that as the pedestrian was running along side of the bus, he was also pounding on the side of the bus. There was no evidence (disturbance of the road film) on the side surface of the bus to support the pounding action of the pedestrian. He also stated that

he could hear students on board the bus yelling for the driver to stop. The school bus driver stated to the police that he heard the pedestrian yelling outside the bus, however, he continued to proceed westbound on the local street.

As the bus had traveled approximately 190' from the bus stop, the pedestrian fell or was pulled to the road surface as the drawstring remained caught in the door of the bus. The jacket yielded a vertically orientated abrasion of the nylon shell that was located 17.25-19.25" above the bottom edge of the jacket and 0.5-1.5" inboard of the right side zipper on the inner surface of the jacket between the zipper and the lining. At this point, the open jacket probably separated from the pedestrian. His right hand swiped the right side surface of the bus in a vertically orientated pattern that removed the road film 74.5-86.25" rearward of the B-pillar between the black rub rails on the side of the bus. All five fingers were evident of the bus as the hand wiped across the lower rub rail onto the lower surface of the bus. The finger wipe marks on the lower surface extended from 83-90.25" rearward of the B-pillar.

The pedestrian apparently fell in a face down attitude on the road surface in a diagonal orientation with respect to the travel direction of the bus. The right rear tires of the school bus subsequently ran over the posterior aspects of the pedestrian's legs and his back area. As a result of the contact with the rear tires and asphalt road surface, the pedestrian sustained abrasive type injuries to the medial posterior aspects of both knees, thighs, and right mid lower leg, abrasions to the right upper quadrant of the back and posterior right shoulder, a partially severed right upper ear, and multiple internal injuries. He bled profusely from the nose and right ear at the scene of the accident. There was no visible crushing injury of the head or thoracic areas.

Following the accident, the bus driver stated to the police that he observed the pedestrian in the exterior mounted rear view mirror lying in the middle of the road, however, he continued to drive the vehicle in a westerly direction. As he had traveled approximately 1.5 blocks from the accident site, a child informed the driver that the pedestrian was lying in the road bleeding. The driver stopped and backed the school bus several hundred feet before stopping the bus approximately 86' west of the accident location. The driver opened the right side door and observed the pedestrian's jacket fall from the door onto the pavement. He apparently used the on board two-way radio and notified his company of the accident.

The pedestrian was transported by ambulance to a local hospital where he expired at 1538 hours, approximately 38 minutes following the accident. The investigating officer noted that the pedestrian had been transported from the scene prior to the arrival of the police. An 8'6" pool of blood evidenced the final rest position of the pedestrian. Adjacent to the blood was the pedestrian's book bag.

The inspection of the pedestrian's jacket indicated that the plastic tab on the end of the right drawstring was pulled against the knot at the end of the string and that the loop in the knot was pulled tight. The plastic tab was also deformed at the centerline of the tab adjacent to the hole for the drawstring. The tab and drawstring remained intact and attached to the jacket. There was an abrasion on the drawstring 5.5-6" inboard of the tab. There appeared to be a small chip of yellow

paint embedded into the fibers of the braided drawstring, however, there was no visible evidence on the exterior of the bus to support the paint chip. The drawstring was pulled taut through the bottom of the jacket and extended 41" outboard of the inside grommet. The right grommet was partially separated from the jacket (refer to Photograph No. 51). The left side of the jacket was gathered against the left side grommet and there was evidence of force applied to the left side adjustment tab (deflection). In addition, the loop for the left side knot was pulled taut against the tab.

There was no distinct evidence on the bus components of loading or snagging of the drawstring. The edge of the rubber door gasket was straight with numerous abrasive type marks in multiple directions. The V-channel was not gouged or marked from the plastic drawstring tab. There was a fabric-type wipe mark on the exterior yellow painted surface of the V-channel located 32.125-33.375" above the ground. The wipe mark extended 0.25" rearward from the edge of the channel (refer to Photograph No. 26).

There were two possible components that could have allowed the drawstring to become caught in the bus. The components are the door/V-channel and the base of the handrail. The handrail was ruled out as a possible mechanism by two sources; the bus driver's statement that he observed the jacket (drawstring) fall as he opened the door and the inability to recreate a snagging of the actual drawstring following numerous tests over the handrail configuration. The large tab and the rounded corners on the tab prevented the drawstring from becoming snagged on the rail. The modified foam rubber pad contributed in deflecting the tab away from a possible snag point. Another style of drawstring tab could become snagged between the rail and the previously identified screw hole as documented in Photograph Nos. 44 and 45.

Using a similar style cord of the same diameter to represent the actual drawstring and an identical tab from the hood of the jacket, numerous tests were performed to recreate the snagging of the drawstring between the door gasket and the V-channel. With the drawstring extended through the door opening, the door was fully closed against the cord. A spring scale was used to measure the pull force required to disengage the drawstring and tab from the door. On the first test, the cord was pulled at an angle that was approximately perpendicular to the side surface of the bus. It required approximately 25 lbs. of force to pull the tab through the gasket to the center point of the V-channel and approximately 90 lbs. of force to disengage the drawstring from the closed door. Subsequent tests required approximately 75, 75, and 55 lbs. of force to pull the drawstring tab through the rubber gasket.

Additional pull tests were performed with the cord extended parallel to the side surface of the bus which represented the actual scenario for this accident. A police officer was positioned inside the school bus to operate the door while another officer recorded the tests photographically. On the first pull test parallel to the side surface of the bus, the spring scale bottomed out at 100 lbs. The officer positioned on the interior of the bus observed that the drawstring tab had remained in a horizontal attitude as it engaged with the center of the V-channel. The spring scale was removed from the cord and the Calspan investigator pulled with maximum effort on the cord in an attempt to disengage the tab from the door. Following several attempts, the tab remained firmly caught between

the door gasket and the V-channel. This pull test procedure is documented in Photograph Nos. 60-67. Additional pulls were performed with the tab positioned vertically and the cord disengaged at 50-75 lbs. of force.

There are three scenarios that provide a mechanism for the drawstring to become caught in the door. The first and least possible is that the drawstring was in a swing-type motion as the pedestrian exited the bus. As he stepped from the bottom step of the bus, the driver closed the bifold on the cord as the cord swung behind the pedestrian. The second scenario involved the drawstring gliding over the handrail as the pedestrian exited the bus. Although the tab was not snagged by the rail, the rail extended the drawstring in a horizontal orientation. The driver subsequently closed the door with the pedestrian standing adjacent to the door and accelerated from the stop, pulling the drawstring taut between the door gasket and the V-channel. The third scenario is similar to the second, however, the drawstring could glide along the shelf between the stairwell and the modesty (kick) panel in a horizontal orientation and become caught as the driver closes the door with the pedestrian adjacent to the door area of the bus.

#### **Conclusions**

- 1. The primary causal factor for this fatal accident was the driver's rapid departure from the bus stop by not allowing the pedestrian sufficient time to clear the bus. The driver also failed to recognize a potentially dangerous situation as he was accelerating from the bus stop and heard the pedestrian yelling outside of the bus. In addition, he apparently failed to check the rear view mirrors of the bus to ensure that the area surrounding the bus was clear of pedestrians. Following the accident, the driver detected the pedestrian lying in the road in the side mirrors, however, since he did not feel a bump from running over an object, he continued to proceed in a westerly direction.
- 2. The construction of the door with the rubber gasket engaging with the V-channel in the fully closed position creates the potential for a similar accident to occur. This combination requires a sufficient force to disengage a small diameter object from the door area as demonstrated in the initial pull tests. A younger child would not possess the strength or weight to free a clothing item from the door.
- 3. The pedestrian reportedly remained at the door area of the bus as he exited the vehicle top talk to a passenger on board the bus. The driver should have detected the pedestrian and directed him away from the bus prior to departing from the bus stop.

# **ATTACHMENT B**

Police Accident Report

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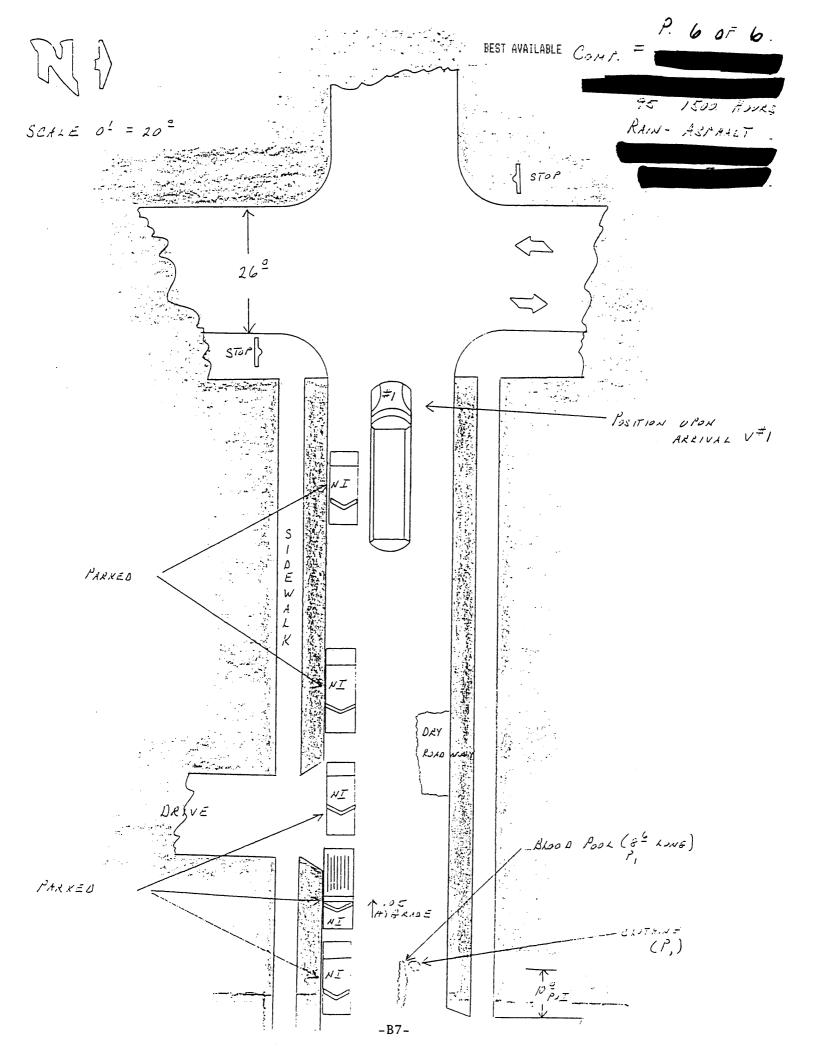
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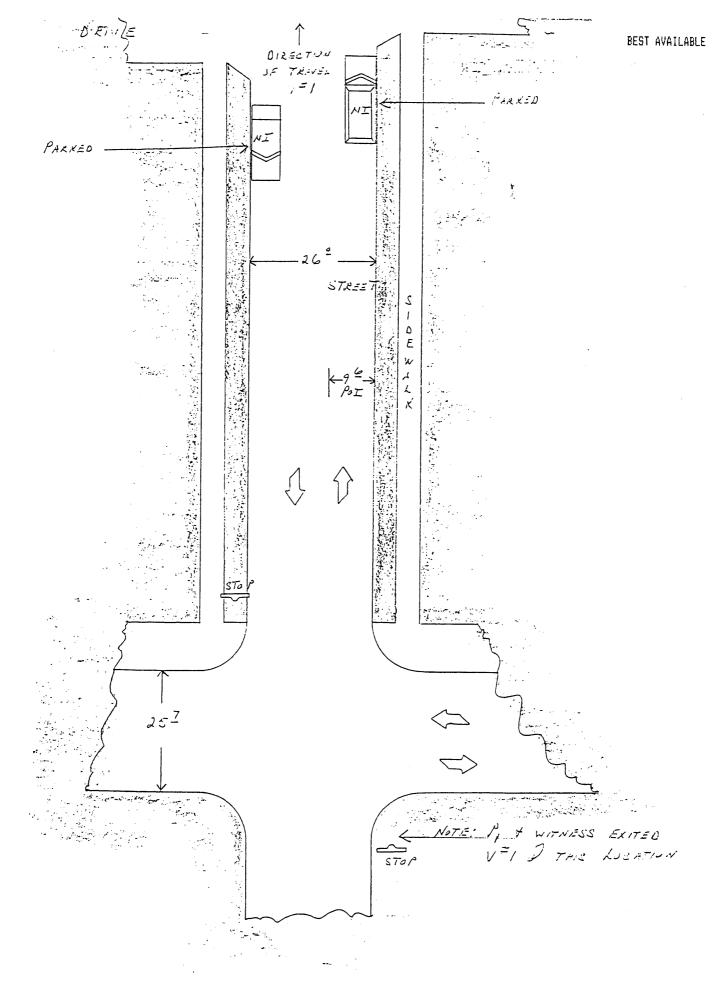
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# **ATTACHMENT C**

Vehicle Recall Notice

Associate Administrator for Enforcement National Highway Traffic Safety Administration 400 Seventh Street, S.W. Washington, D.C. 20590

Subject: Safety Recall

Gentlemen:

Attached is a vehicle defect initial information report which is submitted pursuant to Parts 573.5, 151 (1), and 153 (1-6) of the National Traffic and Motor Vehicle Safety Act.

The undersigned should be contacted for any additional information regarding this recall.

Very truly yours,

Director of Engineering

Enclosures

xc:

## VEHICLE NON-COMPLIANCE INITIAL INFORMATION REPORT

Date:

1993

Recall No.

Make	Model	Model Year	No. of Vehicles	Manufacturing From T	Dates hrough	Other Identification Necessary to Describe Vehicle
WARD	SS1506-3306 Volunteer	1980- 1993	To be determined (est. 45K)	/80	/93	School bus
WARD	SFC2206-3803 Patriot	1983 - 1990	To be determined (est. 1.5K		/90	School bus

(46.5K estimate)

Total number of vehicles: to be determined Percent potentially containing defect: 100%

# TRANSPORTATION CORPORATION VEHICLE NON-COMPLIANCE INITIAL INFORMATION REPORT

- 1. <u>DESCRIPTION OF DEFECT</u>: Certain Volunteer and school buses have a small crevice at the attachment point of the entrance door grab rail to the entrance door body pillar. Also, the space between the grab rail and the modesty panel (if so equipped) may be less than 1 1/2".
- 2. RISK TO MOTOR VEHICLE SAFETY: The possibility exists for certain clothing articles such as draw strings to become lodged in these areas as a person is exiting the bus. If the driver is unaware of this situation, the entrance door may be closed, capturing the item in the door.
- CHRONOLOGY OF PRINCIPLE EVENTS WHICH LED TO DETERMINATION OF DEFECT: On 3. Schools, about the County 1993 we were contacted by buses and buses manufactured by other companies. A letter potential problem on 1993 with a copy of a from NHTSA (NEF-121jah, PE93-008) was received on 1987 a child was injured due to a stating that on letter from Mr. We are aware of no other incidents or claims draw string being caught on a bus. of this nature relative to buses. or
- 4. MEASURES TO BE TAKEN TO REPAIR VEHICLE: Owners will be notified of the defect and a repair kit will be offered free of charge. The owners will be advised that they may make the modifications or contact an dealer for assistance.
- 5. REMEDY EXPENSE: will supply parts at no charge and reimburse owners for labor upon request.
- 6. <u>EARLIEST DATE DEFECT TO BE REMEDIED</u>: To be determined.
- 7. PUBLIC ANNOUNCEMENT DATE: To be determined.
- 8. OWNER LETTER AND DEALER COMMUNICATIONS: To follow when available.

#### SAFETY RECALL

Dear Customer:

This notice is sent to you in accordance with the requirements of the National Traffic and Motor Vehicle Safety Act. Corporation has determined that a defect in the handrail system that relates to motor vehicle safety exists on certain school buses.

The buses involved are and (Volunteer) and (Patriot) model school buses built from 86 through 93. The vehicle identified on the enclosed card fits this description and our records show you as owner of this vehicle.

#### REASON FOR THIS RECALL

If you are the owner, this is to notify you that your bus may have a defect in the attachment of the handrail located inside rear of the entrance door. A small gap may exist at the attachment of the grabrail to the wall. Also, insufficient clearance may exist between the modesty panel (located on the bottom of the crash barrier) and the grabrail. Certain small objects may be caught in these areas such as coat tie strings. Should this happen, and the driver is unaware of the situation, the person may exit the bus with the string caught in the crevice. The door may be closed and the bus moved causing possible injury to the passenger.

As a precaution, until your vehicle is inspected and repaired, you should inform all drivers to be aware of this potential problem.

When you return the enclosed postage paid reply card, an inspection and repair kit will be sent to you. The remedy will be to install a rubber pad on the grabrail where it attaches to the wall and to move the modesty panel to the rear far enough to attain 1 1/2" of clearance with the grabrail. You may make these repairs yourself or take your vehicle to your dealer on a mutually agreed upon service date. If he does not remedy this condition without charge on or within 5 days, you can obtain assistance by calling Customer Service at the toll free number listed below. You may also wish to submit a

Customer

Page 2

1993

complaint to the Administrator, National Highway Traffic Safety Administration, 400 Seventh Street, S.W., Washington, D.C. 20590, or call the toll free Auto Safety Hot Line at (Washington, D.C. area residents may call if you believe that Corporation or its dealer has failed to remedy the non-compliance without charge, within a reasonable time, which is no longer than 60 days after you first tender to obtain repair.

In the event you no longer own the vehicle described, please fill in the requested information on the enclosed postage-paid card and return it to us. This will enable us to notify the correct owner.

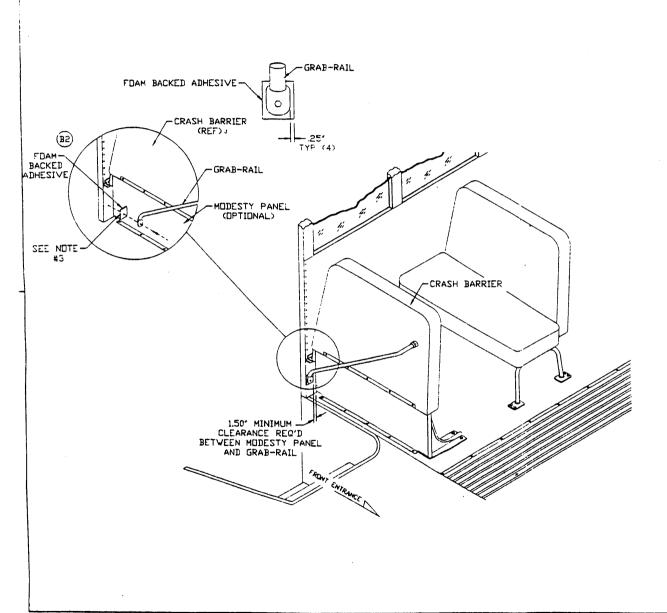
If you have questions concerning this notification, please contact an authorized school bus body dealer. You may locate your nearest dealer by calling Or, you may call our Customer Service Department at

Sincerely,

**ORPORATION** 

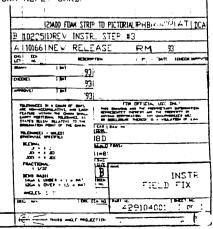
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	1 1 5 11	429101001	WOOD, BLOCK 1.50" X 1.50" X 1.50"	11
	- <u>1</u>	429102001	SCREW, SELF DRILLING HEX WASHER HEAD	10
(R)	<u>-</u> -	429103001	SEALANT, FOAM .25" X 2.0" X 2.5" ADHESIVE BACKED	1
	$-\frac{3}{4}$	206680000	SCREW, AB HH 5/16" X 1"	1
	5	429104001	GRAB-RAIL, INSTR FIELD FIX	1 1

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#### ' INSTRUCTIONS '

- IF BARRIER IS EQUIPPED WITH 4 MODESTY PANEL USE THE 1.50' SPACER BLOCK PROVIDED (PN 42910100): TO DETERMINE THE MINIMUM CLEARANCE BETWEEN THE GRAB-RAL AND MODESTY PANEL. THE BLOCK SHOULD FIT EASILY BETWEEN THE GRAB-RAIL AND MODESTY PANEL. IF ADEQUATE CLEARANCE EXISTS, DISCARD BLOCK AND PROCEED TO STEP #3. IF ADEQUATE CLEARANCE DOES NOT EXIST, (BLOCK WON'T FIT IN SPACE BETWEEN GRAB-RAIL AND MODESTY PANEL) PROCEED TO STEP #2.
- 2. REMOVE ALL SHEET METAL SCREWS ATTACHING MODESTY PANEL TO FLODR. USING THE SPACER BLOCK AS A MEASURING GUIDE, PUSH THE LOWER PART OF THE MODESTY PANEL REARWARD TO ATTAIN THE MINIMUM 1.50° CLEARANCE BETWEEN THE GRAB—RAIL AND MODESTY PANEL. USING THE SELF DRILLING SHEET METAL SCREW PROVIDED (PN 429102001) RE-ATTACH THE MODESTY PANEL TO THE FLODR IN ITS NEW POSITION. DNCE AGAIN USING THE BLOCK PROVIDED, CHECK FOR THE REQUIRED CLEARANCE (IF THE REQUIRED CLEARANCE COULD NOT BE ATTAINED BY MOVING THE LOWER PART OF THE MODESTY PANEL, SEE STEPS #3 & #4.) USE OUALITY SEALER TO FILL HOLES IN FLOOR WHER HODESTY PANEL VAS HOUNTED, OR REPLACE SCREVS IN HOLES. IF THE CLEARANCE IS ADEQUATE PROCEED TO STEP #3.
- 3. REMOVE THE LAG SCREW THAT ATTACHES THE GRAB-RAIL TO THE VALL (AN ADDITIONAL LAG SCREW, PN 206680001, IS PROVIDED.) REMOVE THE LAG SCREW THAT ATTACHES THE GRAB-RAIL TO THE BARRIER. APPLY THE ADHESIVE BACKED FOAM STRIP PROVIDED (PN 429103002) TO THE LOWER FLAT ATTACHING SURFACE ON THE GRAB-RAIL. ALIGN THE HOLE IN THE FDAM WITH THE HOLE IN THE GRAB-RAIL. THERE SHOULD BE APPROX. 25' OF FDAM EXTENDING ARDUND THE BASE OF THE GRAB-RAIL. (THIS VILL FILL ANY VOIDS BETWEEN THE GRAB-RAIL AND THE WALL.) ALSO, IF THE GRAB-RAIL VAS LOCATED SO THAT THE MOUNTING SURFACE WAS HELD AVAY FROM THE VALL BY A RIVET, REMOVE THE RIVET. RE-ATTACH THE GRAB-RAIL TO THE VALL MOVE ATTACHMENT POINT CLOSER TO DOOR OPENING IF 1.50° CLEARANCE COULD NOT BE ATTAINED IN STEP #2. CHECK TO MAKE SURE THERE ARE NO GAPS BETWEEN GRAB-RAIL AND WALL.
  - 4. IF THE REQUIRED 1.50' MINIMUM CLEARANCE COULD NOT BE ATTAINED IN STEPS #1, #2, 6 #3 ABDVE, IT WILL BE NECESSARY TO MOVE THE BARRIER REARVARD. NOTIFY YOUR NEAREST DEALER FOR ASSISTANCE, OR CALL 1-800-843-5615.
    - 5. FILL DUT AND RETURN REPLY CARD.



# COLOR PHOTOGRAPHS CALSPAN SCHOOL BUS/PEDESTRIAN INVESTIGATION



1. School buses' approach to the designated bus stop at the intersection.



2. Approximate area where the students were discharged from the bus.



3. Bus driver accelerates vehicle from stop with pedestrian running along side the bus with drawstring caught between the bifold door and the B-pillar V-channel.



4. Lookback view of the buses' approach to the designated bus stop.



5. Bus continues forward in an easterly direction with pedestrian running/dragged along right side of bus.



6. Area where pedestrian was run over by the right rear tires of the bus.



7. Lookback view of the buses' trajectory from the area of impact.



8. Continued trajectory of the bus post-event.



9. Frontal view of the involved school bus.



10. Left front three-quarter view of the school bus.



11. Left side view of the school bus.



12. Left rear three-quarter view.



13. Right front three-quarter view showing the mirrors and door area of the involved bus.



14. Close-up view of the convex and plane (flat) mirrors.



15. Overall interior view of the frontal area of the school bus.



16. Vehicle manufacturer's identification labeling affixed to left side of bulkhead.



17. School bus body manufacturer's identification label riveted to the right side of the bulkhead.



18. Manually operated mechanical linkage system for the right side door.





19. Interior view of the bifold doors and stairwell.

20. Overall exterior view of the door and stairwell.







22. V-channel along right B-pillar.



23. Additional view of the V-channel.



24. Close-up view of the V-channel.



25. Possible area where the drawstring tab was caught between the door and the V-channel.



26. Faint fabric-type (patterned) wipe mark on right side surface of bus.



27. Depth (17/32") of the V-channel.



28. Width of the door weatherstripping/gasket on exterior surface.



29. Thickness of the rubber weatherstripping/gasket.



30. Interior width of the weatherstripping/gasket.



31. Overall view of the stairwell handrail.



32. Additional view of the handrail.



33. Lateral offset between the handrail and the modified placement of the kick panel.



34. Longitudinal view of the handrail.





35 & 36. Lower attachment point of the handrail with the modified foam rubber pad installed.



37. Close-up view of the lower attachment point and the installed foam rubber pad. (Note the snap at the base of the handrail attachment point; probably resulted from a previous clothing snag with the handrail.)



38. Offset between the handrail and the V-channel at the trailing edge of the door opening.



39. Longitudinal view of the modified placement of the lower kick panel.



40. Visible line highlighted with yellow arrows indicates the original placement of the kick panel.



41. Calibrated tape documents the distance that the kick panel had been repositioned.



42. Close-up view of the repositioned kick panel at the outboard corner.



43. Former sheetmetal screw hole with exposed burrs from the initial installation of the kick panel.



44. A "drawstring" constructed from chalkline and an alligator clip became snagged between the bottom of the handrail and the burrs at the screw hole on the first test.



45. Close-up view of the snagged alligator clip. (The actual drawstring and adjustment tab from this accident would not snag at this point following numerous attempts.)



46. Overall view of the exterior of the pedestrian's jacket.



47. Inside (lining) view of the pedestrian's jacket.



48. Manufacturer's labels affixed to neck area of the jacket.



49. Abrasion to the right inner surface of the jacket from probable road surface contact.



50. Full length of the drawstring (41") which was pulled out of the right side of the jacket.



51. Torn fabric around the right side grommet of the jacket.



52. Gathered fabric at the left side of the jacket from the pull on the drawstring.





53. & 54. Left side adjustable tab.



55. Right side adjustable tab which became caught between the door and the V-channel.



56. Overall length of the adjustable tab (1 1/16").



57. Width of the tab (5/8").



58. Snag with a possible paint chip in the drawstring at 5.5-6.0" above the adjustable tab.



59. Close-up view of the drawstring snag.



60. Recreation of the drawstring tab caught between the door and the V-channel.



61. & 62. Close-up views of the drawstring tab caught between the door and the V-channel.





63. & 64. Exterior views of the drawstring extending from the door/V-channel juncture.



65. Overall view of the pull test using a spring scale to measure the force exerted on an exemplar type drawstring.



66. Exemplar drawstring extending from door during pull test.



67. Pull force exceeding 100 lbs. as recorded on spring scale.



68. Overall view of the right side of the school bus with the pedestrian contact outlined with tape.



69. Pedestrian's right hand wipe mark on side surface of bus. Wipe mark was located 74.5-90.25" rearward of the B-pillar.



70. Additional view of the pedestrian's right hand wipe mark.



71. Close-up view of the right hand wipe mark.



72. Right rear dual wheels which ran over the pedestrian.



73. Conspicuity of a person standing adjacent to the right B-pillar area of the vehicle in the right convex mirror.



74. Conspicuity of the person adjacent to the right B-pillar in the right rectangular plane mirror.